Poultry Waste Generation and Land Application in the Illinois River Watershed and Phosphorus Loads to the Illinois River Watershed Streams and Rivers and Lake Tenkiller

Expert Report of Dr. B. Engel

For
State of Oklahoma
In Case No. 05-CU-329-GKF-SAJ

State of Oklahoma v. Tyson Foods, et al.
(In the United States District Court for the Northern District of Oklahoma)

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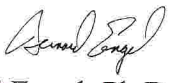

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Table 10.11. Statistical summary of phosphorus scenarios based on daily P output for Illinois River at Tahlequah

Treatment	N	Mean Daily P Load (lb)
Continue Waste Application	36525	543.69[a]
Waste Cessation	36525	270.00[b]
50 Year Growth	18300	876.26[c]
No Waste Background P	36525	156.44[d]
Waste Cessation + Buffer	36525	262.07[e]
Waste Cessation + Buffer All	36525	244.51[f]

Note: Means with the same letter are not significantly different at the 5% level.
N is number of observations (daily P loads)

Table 10.12. Statistical summary of phosphorus scenarios based on daily P output for Baron Fork near Eldon

Treatment	N	Mean Daily P Load (lb)
Continue Waste Application	36525	141.64[a]
Waste Cessation	36525	99.16[b]
50 Year Growth	18300	172.58[c]
No Waste Background P	36525	37.04[d]
Waste Cessation + Buffer	36525	93.00[e]
Waste Cessation + Buffer All	36525	82.46[f]

Note: Means with the same letter are not significantly different at the 5% level.
N is number of observations (daily P loads)

Table 10.13. Statistical summary of phosphorus scenarios based on daily P output for Caney Creek

Treatment	N	Mean Daily P Load (lb)
Continue Waste Application	36525	25.18[a]
Waste Cessation	36525	23.13[b]
50 Year Growth	18300	29.63[c]
No Waste Background P	36525	18.89[d]
Waste Cessation + Buffer	36525	21.86[e]
Waste Cessation + Buffer All	36525	19.06[d]

Note: Means with the same letter are not significantly different at the 5% level.
N is number of observations (daily P loads)

10.8 Allocation of P to Sources

Poultry waste land application in the IRW is a substantial contributor (45% between 1998 and 2006 and 59% between 2003 and 2006) to P loads to Lake Tenkiller, representing the largest P source. WWTP P loads are the second largest contributor to P loads to Lake Tenkiller. Poultry plant discharges to WWTP represent a significant portion of WWTP P loads.

The P contribution of each significant source was determined using the IRW modeling (Appendix D). The P allocation to each source is shown in Tables 10.14 and 10.15. P loads from poultry waste application within the IRW represents 45% of P loads to Lake Tenkiller between 1998 and 2006. Following a change in WWTP technology that reduced WWTP P discharges, poultry waste application in the IRW was responsible for 59% of P loads to Lake Tenkiller for years 2003-2006.

Table 10.14. IRW P Load Allocation to Sources

	WWTP	Forest	Crop	Urban	Pasture
1998-2006	30	1	< 1	7	62
2003-2006	15	1	< 1	7	76

Table 10.15. IRW P Load Allocation to Sources

	WWTP					Pasture		
	Poultry	Nonpoultry	Forest	Crop	Urban	Cattle Near Streams Only	Poultry Only	Swine, Dairy, Background
1998-2006	10	20	1	< 1	7	6	45	11
2003-2006	3	12	1	< 1	7	6	59	11

WWTP discharges are the second largest contributor of P loads representing 30% of P loads between 1998 and 2006 (Table 10.14). A portion of the WWTP P load is attributable to poultry processing discharge to the Springdale WWTP as described in Section 6. Poultry processing discharges released by the Springdale WWTP represent 10% of total P loads to Lake Tenkiller between 1998 and 2006 and 3% of P loads between 2003-2006 (Table 10.15).

Pasture with swine and dairy waste application and background P from pastures is the third largest P load to Lake Tenkiller (Tables 10.14 and 10.15). Runoff from urban areas is the fourth largest contributor at 7% of P loads (Tables 10.14 and 10.15). Cattle in and near streams contribute 6% of P. However, this is almost all poultry P because cattle only facilitate the transport of P (discussion of cattle contributions follows in the next section). Other sources of P loads are responsible for 1% or less of P loads to Lake Tenkiller.

These results are consistent with other reports for the IRW (Section 2 of this report) and with studies for similar watersheds. The Draft TMDL for the IRW and Lake Tenkiller (USEPA Region 6 and Department of Environmental Quality State of Oklahoma, 2001) identified pastures on which poultry waste is applied as being responsible for 56% of P to Lake Tenkiller. Smith et al. (1997) indicated more than 78% of P loads in the IRW were attributable to livestock waste. Storm and White (2003) estimated that poultry waste was responsible for more than 49% of P loads in the Eucha Spavinaw Watershed that has similar conditions to the IRW.